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NODULATION STATUS OF SOME LEGUME SPECIES FROM CACHE VALLEY AND NORTHERN UTAH

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ABSTRACT

Nodulation was studied in 60 species within 31 genera distributed in sixteen tribes of sub-families Mimosoideae and Papilionoideae from the Cache Valley and northern Utah. All the species examined were nodulated to various extent under natural habitat or when grown in uninoculated garden soil. Nodulation in seven species within five genera is reported for the first time as checked against existing reports of nodulation.

KEY WORDS: Nodulation, Leguminosae, Mimosoideae, Papilionoideae, taxonomy, Utah

INTRODUCTION

The Utah flora is abundantly represented among legumes. The legume family, with 48 genera and 248 species, is one of the largest families found in Utah (Welsh, *et al.* 1993). In number of species, the family ranks second after Asteraceae and third after Poaceae (Welsh, *et al.* 1993). Weedy species represent only a small proportion of adventive species, the majority of adventives consists of cultivated crops and ornamental plants. More than half of 48 legume genera in Utah, accounting for about 52 species, are known from introduced plants (Welsh, *et al.* 1993). The family is economically important as a source of quality timber, protein-rich seeds, and nutritious fodder. The most economically derived crop is alfalfa and thousands of acres are planted to this forage crop in the fields, ranches, and rangelands of Utah. Little is known about nodulating legumes or their rhizobia from Utah. The present study was conducted to determine the nodulating ability of some of the legume species of Utah.

MATERIALS AND METHODS

Legume species growing under natural growth conditions were surveyed for their nodulating ability from the Cache Valley and adjacent six counties of northern Utah. Climatic conditions in these counties vary from the hot, dry desert of western Box Elder County to the humid alpine ecosystem of Summit and Daggett counties (Shaw 1989). Phytographic considerations in Utah involve the concepts of floras previous to the recent past, migrational pathways, and development of species in place (Welsh, *et al.* 1993).

Periodic field trips were made during late spring and summer to various counties of northern Utah. Observations of nodules were made as described previously (Athar 1996a). Wild legumes were examined under natural habitats while legumes of agricultural importance were observed from the cultivated fields. Legumes examined included herbs, shrubs, trees, and vines. Some of the grain and tree legumes were grown in pots containing garden soil. Nodules were distinguished from other kinds of root-malformations such as those caused by nematodes, insects or other root-inhabiting parasitic microorganisms.

RESULTS AND DISCUSSION

Table 1 gives results of 60 species within 31 genera distributed in sixteen tribes of sub-families Mimosoideae and Papilionoideae. Species are arranged alphabetically within genera. The nomenclature and tribal classification are those following Polhill & Raven (1981). Authors' citations are quoted following instructions of Brummit & Powell (1992) as endorsed by the International Working Group on Taxonomy Database for Plant Science (TDWG). The species reported here represent only one fourth of the species listed as occurring in Utah. All the species examined were nodulated to various extents. Nodulation in seven species within five genera is reported for the first time as checked against existing reports of nodulation (Aguilar, *et al.* 1994; Allen & Allen 1981; Athar 1996a, 1996b, 1997; Athar & Mahmood 1990; Faria, *et al.* 1994; Moreira, *et al.* 1992; Mahmood & Iqbal 1994; Subramaniam & Babu 1994). The nodules observed in other species confirmed earlier reports (Allen & Allen 1981; Athar 1996a; Mahmood & Iqbal 1994).

It was not possible to carry out either structural studies, test for acetylene reduction activity or to isolate rhizobia from the nodulated legumes. Since the legume species examined from northern Utah were all nodulated to various extents, they may help in improving the soil fertility of rangelands of the Intermountain Region. Improved nitrogen availability in rangeland soils through legume-*Rhizobium* symbiosis would substantially improve their forage production capacity and at the same time improve stability of these sometimes fragile ecosystems. It would be imperative that further research be conducted to select legume-*Rhizobium* combinations and their role in increasing the productivity of agriculture and rangelands of Utah.

Table 1. List of legume species examined for nodulation.

Species	Legume		Nodulating status[3]
	Type[1]	Habit[2]	
MIMOSOIDEAE			
Acacieae			
Acacia nilotica (L.) Willd. *ex* Del.	CG	T	A
Mimoseae			
Leucaena leucocephala (Lam.) de Wit.	CG	T	A
Mimosa pudica L.	CG	H	A
Prosopis glandulosa Torr.	WF	T	A
P. juliflora (Sw.) DC.	WG	T	A
PAPILIONOIDEAE			
Aeschynomeneae			
Arachis hypogaea L.	CG	H	A
Cicereae			
Cicer arietinum L.	CG	H	A
Dalbergieae			
Dalbergia sisso Roxb.	CG	T	A
Galegeae			
Astragalus argophyllus Nutt. *ex* T. & G.	WF	H	B
A. beckwithii T. & G.	WF	H	B
A. cicer L.	WF	H	A
Genisteae			
Lupinus argenteus Pursh	WF	H	B
L. leucophyllus Dougl.	WF	H	B
Hedysareae			
Hedysarum boreale Nutt.	WF	H	A
H. occidentale Greene	WF	H	B
Indigofereae			
Cyamopsis tetragonoloba (L.) Taub.	CG	HS	A
Loteae			
Lotus corniculatus L.	WF	H	A
Millettieae			
Wisteria chinensis DC.	CF	V	A

Table 1. (continued).

Species	Legume Type[1]	Legume Habit[2]	Nodulating status[3]
Phaseoleae			
Cajanus cajan (L.) Millsp.	CG	ST	A
Clitoria ternatea L.	CG	H	A
Glycine max (L.) Merr.	CG	H	A
Lablab purpureus (L.) Sweet	CG	H	A
Macroptilium atropurpureum Urb.	CG	H	A
Phaseolus coccineus L.	CG	H	A
P. lunatus L.	CG	H	A
P. vulgaris L.	CG	H	A
Vigna aconitifolia (Jacq.) Marechal.	CG	H	A
V. mungo (L.) Hepper	CG	H	A
V. radiata (L.) Wilczek.	CG	H	A
V. unguiculata (L.) Walp.	CG	H	A
Thermopsideae			
Thermopsis montana Nutt.	WF	H	A
T. rhombifolia (Nutt.) Richards	WG	H	B
Robinieae			
Robinia pseudoacacia L.	CG	T	A
Sesbania punicea Benth.	CG	ST	A
S. sesban L.	CG	ST	A
Trifolieae			
Medicago falcata L.	WG	H	A
Medicago lupulina L.	WF	H	A
Medicago polymorpha L.	WF	H	A
Medicago sativa L.	CF	H	A
Melilotus alba Medik.	WF	H	A
Melilotus indica (L.) All.	WF	H	A
Melilotus officinalis (L.) Lam.	WF	H	A
Trifolium alexandrinum L.	CG	H	A
Trifolium fragiferum L.	WF	H	A
Trifolium pratense L.	CG	H	A
Trifolium repens L.	CG	H	A
Trifolium subterraneum L.	CG	H	A
Trifolium variegatum Nutt.	WF	H	A
Trigonella foenum-graecum L.	CF	H	A

Table 1. (continued).

Species	Legume		Nodulating status[3]
	Type[1]	Habit[2]	
Vicieae			
Lathyrus brachycalyx Rydb.	WF	V	B
L. latifolius L.	CF	V	A
L. odoratus L.	CF	V	A
L. sativus L.	CG	V	A
L. sylvestris L.	WF	V	A
Lens culinaris Medik.	CG	H	A
Pisum sativum L.	CF	V	A
Vicia americana Muhl.	WF	H	A
V. faba L.	CF	H	A
V. sativa L.	WF	V	A
V. villosa Roth.	WF	V	A

[1]Plant type: C = Cultivated; W = Wild; F = Studied in the field under natural habitat; G = Studied in pots containing garden soil.

[2]Plant habit: H = Herb; S = Shrub; T = Tree; V = Vine or climber.

[3]Nodulating status: A = Nodulation previously observed; B = New report.

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